In the Matter of

Targeted Changes to the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields **ET Docket No. 19-226**

The FCC Must Prepare an Environmental Impact Statement For New Human Exposure Rules on Wireless Radiation Exposure

By Theodora Scarato MSW

The FCC has failed and refused to prepare any EIS covering this major new federal agency action of expanding human exposure limits for wireless radiation in Notice of Proposed Rulemaking (19-126) **ET Docket No. 19-22.**

The FCC's 2019 proposal would create human exposure limits for 100 GHz (same as .1 THz) up to 3 THz. The proposal would also create human exposure rules on lower frequencies from 300 KHz down to 3 KHz. **No Environmental Impact Study relating to these frequencies has ever been issued by the FCC in compliance with NEPA.**

I have been submitting scientific papers on wireless radiation biological impacts to the FCC for over a decade. See my filings here. The FCC should no longer ignore the scientific evidence and it must ensure full compliance with NEPA by ensuring an environmental impact study.

I oppose the FCC's adoption of the proposed rules as superficial, arbitrary and capricious, and I urge the FCC to initiate or request thorough and comprehensive research and study of the rule's impact on human health as well as wildlife using a biological approach including all of these key factors that operate in combination in high frequency transmissions to affect environmental exposure to RF radiation:

- Frequencies that are resonant in human bodies and cells as well as animal bodies and cells (including insects).
- The effect of modulation of those frequencies on humans, animals and plants.
- The impact of different lengths of time of exposure on humans, animals and plants.
- The impact of cumulative effects of repeated or continuous exposure on humans, animals and plants.
- The impact of cumulative effects of repeated or continuous exposure of multiple frequencies and modulations on humans, animals and plants.
- The impact of synergistic or additive effects of multiple frequencies and modulations in combination with other environmental toxins or exposure such as air pollution, metals and ionizing radiation on humans, animals and plants.
- Individual variation in susceptibility in population subgroups to RF radiation exposure such as children, the elderly and medically vulnerable.

- The impact of different levels of radiated power (ERP) for the foregoing modulated frequencies.

If the research on biological effects has not been properly performed to ensure long term safety then these frequencies should be prohibited from deployment and coverage by FCC regulations. A robust Environmental Impact Study relating to these frequencies must be performed by the FCC in compliance with NEPA.

The FCC has taken the position that its present safety standards – based solely on thermal effects from short term exposure– provide adequate protection for all humans. The FCC has flatly refused to launch a proper scientific review of the research and has affirmed its outdated antiquated 1996 limits. Then the FCC has used this affirmation as the basis to expand frequencies addressing its regulations despite zero scientific research on long term safety for humans or animals. This is wrong.

This major new action requires the FCC to comply with NEPA by filing a new comprehensive environmental impact statement. The nationwide use of these frequencies will "significantly" affect the quality of the human environment, and requires the preparation of an EIS because:

1. The FCC action will affect society as a whole – indeed that is its express goal and objective. Wireless radiation is ubiquitous and cell towers and wireless networks are going up in every environment.
2. The FCC action will have impacts that are both beneficial and adverse.
3. The FCC action will directly affect public health if the findings of the existing studies indicating long term and biological impacts are confirmed.
4. The FCC action will particularly impact children and pollinators.
5. The effects of the FCC's action on the human environment are highly uncertain and involve unknown risks.
6. A principal characteristic of non-ionizing frequencies is that its harm lies in cumulatively significant impact after years of exposure to wireless emissions.
7. In addition to human health risks, increasing numbers of studies have shown that emissions from wireless transmission towers threaten habitats for nesting birds, amphibia, plants and wildlife, causing a decline in offspring – these effects are indiscriminate and adversely affect endangered and threatened species equally.

The FCC must show proper review regarding the impacts of resonance and hotspots to body and organ and tissue structures of both humans, animals and plants. Federal agencies with expertise in human health and wildlife must show proper review of the scientific evidence and submit robust researched comments to the FCC.

As detailed by the EMR Policy institute in its PETITION FOR WRIT OF MANDAMUS TO THE UNITED STATES COURT OF APPEALS SECOND CIRCUIT by GABRIEL NORTH SEYMOUR and WHITNEY NORTH SEYMOUR, JR. which was a major source for this entire petition.

> "Resonance is a well-established physical effect in biological tissue. In strict physics terms, resonance is what occurs when some aspect of a force, such as a frequency wave, matches some

characteristic of an object, such as the human anatomy. When there is a resonant "match" the power inherent in the wavelength is maximally transferred to the object, causing it to vibrate or resonate. One dramatic example of a resonant match is when an opera singer hits the high-C note in the presence of a crystal goblet, causing it to resonate and shatter. Radio waves differ in length. So do physical objects. Humans and all other species have individual resonant matches. The current thermal standards at the FCC recognize the "average" human anatomy at approximately 6 feet tall. At 6-feet, that is a perfect whole-body resonant match between 30-300 MHz. That specifically includes the FM radio bands as well as others. It is because of resonance matching that the FCC standards are more stringent in those areas. But the FCC only takes whole-body resonance into consideration in their standards. Individual organs have their own resonance models. Human brain tissue, for example, reaches peak absorption in the ultra-high frequency ranges, right where all of the new cellular telephone functions and where the new licenses are proposed for auction. Yet, no specific standard exists at the FCC for ambient exposure for individual organs."

"In addition, another well-known biophysics principle that can result from resonance is the creation of standing energy "hotspots." For example, human brain tissue can experience RF hotspots from ultrahigh frequency radiation because the skull is a "chamber" that does not dissipate energy the same way that the rest of the body will. Given a chamber (or object) whose dimension equals a multiple or one-half fraction of a radio wave length, the chamber or object will resonate at that radio frequency. The intensity of the particular radio waves will increase as they "bounce" back and forth inside the chamber. This can be easily understood with sound waves, which operate much the same way. A tuning fork vibrates intensely as it is struck and emits a sound wave equal to its length, for instance. It is reasonable to assume that a resonator chamber such as a baby's skull), other human organs, and small 13 living creatures – in particular frogs and birds which are particularly vulnerable to constant exposure to these specific frequency bands – will suffer standing wave hotspots from the proposed AWS range of frequencies to be auctioned by the FCC. The full effects are presently unknown but can easily be imagined – brain damage, embryo damage, organ damage. Frog eggs, for instance, are known to die from microwave exposure. Water is a conductive medium. Yet none of this biological understanding is factored into the current FCC regulation. A full EIS would reveal a range of interdisciplinary knowledge. That is why Federally-funded research is so important, and why preparation of an EIS by the lead agency is critical."

The FCC must specifically address these frequencies impacts to wildlife, especially pollinators. On August 13, 2021, the United States Court of Appeals for the District of Columbia Circuit ruled in our case against the FCC (*EHT et al. v FCC*),[1] stating "we find the Commission's order arbitrary and capricious in its complete failure to respond to comments concerning environmental harm caused by RF radiation." The Commission also "completely failed even to acknowledge, let alone respond to, comments concerning the impact of RF radiation on the environment. That lack of a response does not meet the Commission's

[1] Final Court Decision EHT et. al v. the FCC 8/13/2021 https://www.cadc.uscourts.gov/internet/opinions.nsf/FB976465BF00F8BD85258730004EFDF7/$file/20-1025-1910 111.pdf

obligation to provide a reasoned explanation for terminating the notice of inquiry."[2] Despite the 2021 court order, the FCC has remained silent. It has taken no action to justify its refusal to update its 1996 wireless radiation exposure guidelines, especially in regards to environmental impacts. **The FCC cannot use its 2019 "arbitrary and capricious" decision to support the newly proposed limits.**

In 2021 a three-part landmark research review by U.S experts of over 1,200 studies on the effects of non-ionizing radiation to wildlife entitled "Effects of non-ionizing electromagnetic fields on flora and fauna" found adverse effects in all species studied at even very low intensities. Findings included impacts to orientation, migration, reproduction, mating, nest, den building and survivorship.[3] [4] [5]

In a review published in *Environment International* on the ecological effects of RF-EMF, 70% of the studies reviewed found RF had a significant effect on birds, insects, other vertebrates, organisms, and plants, with development and reproduction in birds and insects being the most strongly affected.[6] Biologists caution that non ionizing electromagnetic radiation is a critical factor in the decline of pollinator and insect populations.[7]

A 2023 systematic review and meta-analysis of studies on the biological effects on insects of non-ionizing electromagnetic fields, including cell tower and Wi-Fi radiation, was published in the journal Reviews on Environmental Health, finding the "vast majority of studies found effects, generally harmful ones" with toxic effects such as impacts to reproduction and immune health occurring at legally allowed exposure levels. [8]

Pollinators at Risk: Higher Exposures to Insects From 5G and Higher Frequencies

- The study "Exposure of Insects to Radio-Frequency Electromagnetic Fields from 2 to 120 GHz" by Thielens et al 2018 published in Scientific Reports found that for the 4 insects studied (western honeybee, australian stingless bee, beetle, locust), exposure at and above 6 GHz could lead to an increase in absorbed power between 3–370% (a factor if over 3 times.) The researchers concluded that "this could lead to changes in insect behavior, physiology, and morphology over time…"

- A follow up study on the honeybee entitled "Radio-Frequency Electromagnetic Field Exposure of Western Honey Bees" published in Scientific Reports by Thielens et al (2020) modeled exposure

---

[2] https://www.cadc.uscourts.gov/internet/opinions.nsf/FB976465BF00F8BD85258730004EFDF7/$file/20-1025-1910111.pdf

[3] Levitt, B. B., Lai, H. C., & Manville, A. M. (2021). Effects of non-ionizing electromagnetic fields on flora and fauna, Part 3. Exposure standards, public policy, laws, and future directions. *Reviews on Environmental Health*.

[4] Levitt, B. B., Lai, H. C., & Manville, A. M. (2021). Effects of non-ionizing electromagnetic fields on flora and fauna, part 1. Rising ambient EMF levels in the environment. *Reviews on Environmental Health*, *37*(1), 81–122.

[5] Levitt, B. B., Lai, H. C., & Manville, A. M. (2021). Effects of non-ionizing electromagnetic fields on flora and fauna, Part 2 impacts: How species interact with natural and man-made EMF. *Reviews on Environmental Health*, *37*(3), 327–406.

[6] Cucurachi, S., Tamis, W. L. M., Vijver, M. G., Peijnenburg, W. J. G. M., Bolte, J. F. B., & de Snoo, G. R. (2013). A review of the ecological effects of radiofrequency electromagnetic fields (RF-EMF). *Environment International*, *51*, 116–140.

[7] Balmori A. (2021) Electromagnetic radiation as an emerging driver factor for the decline of insects. Science of the Total Environment. 767: 144913

[8] Thill A, Cammaerts MC, Balmori A. Biological effects of electromagnetic fields on insects: a systematic review and meta-analysis. Rev Environ Health. 2023 Nov 23

in various life cycle stages (worker, drone, larva, and queen) and combined the data with in-situ measurements of environmental RF-EMF exposure near beehives in Belgium in order to estimate realistic exposure and absorbed power values. Again, they found even a relatively small shift of 10% of environmental incident power density from frequencies below 3 GHz to higher frequencies will lead to a relative increase in absorbed power of a factor higher than 3.

- In a subsequent study, researchers modeled the exposures of 2.5 to 100 GHz into the honeybee brain and vital organs in Estimation of the Specific Absorption Rate for a Honey bee Exposed to Radiofrequency Electromagnetic Fields from 2.5 to 100 GHz," by Jeladze et al (2023) and found relatively higher SAR values are observed at 12, 25, and 40 [GHz] frequencies in the 4.8 - 8 W/Kg range, especially for the brain tissue. The SAR values varied depending on exposure parameters such as the direction of the incident plane wave, polarization, frequency, and body peculiarities. The authors conclude that, *"based on the obtained results, we can conclude that the exposure to high-frequency RF-EMFs on honey bees might have an undesired impact, which can cause an attenuation of the vital functions of this important insect."*

- "Radio-frequency exposure of the yellow fever mosquito (A. aegypti) from 2 to 240 GHz," published in PLOS Computational Biology, which found that for the given incident RF power, the absorption increases with increasing frequency between 2 and 90 GHz with a maximum between 90 and 240 GHz. Even at the same incident field strength, the power absorption by the mosquito is 16 times higher at 60 GHz than at 6 GHz.
  For 120 GHz, this increase is even larger compared to 6 GHz, with a factor 21.8. The absorption was highest in the region where the wavelength matches the size of the mosquito. The authors conclude that, "In the future, the carrier frequency of telecommunication systems will also be higher than 6 GHz. This will be paired with higher absorption of EMF by yellow fever mosquitoes, which can cause dielectric heating and have an impact on behavior, development and possibly spread of the insect."

I request the FCC to prepare and file an Environmental Impact Statement pursuant to the National Environmental Protection Act, 42 U.S.C. § 4332(c), addressing issues of human, wildlife and ecosystem health, before moving forward with *any new exposure limits for wireless frequencies.* If the FCC does not, the impact will be irreparable harm to people, wildlife and delicate ecosystems.

The continuing validity and effectiveness of the National Environmental Policy Act is at stake in this proceeding and others regarding wireless radiation, where the FCC has refused to ensure public and environmental health protection.

Sincerely
Theodora Scarato, MSW